Project Hail Mary Challenge
Participant FAQ

Last updated	March 25, 2026

Fairness note: To keep the challenge fair, participant questions and official responses are added to this public FAQ so all teams receive the same guidance.

Design Requirements

Question

Does our design need to look like the spacecraft in the book?

Answer

No. Designs should be inspired by Project Hail Mary but do not need to match the novel exactly. Creativity is part of the scoring.

Question

Why must the masses be unequal?

Answer

Unequal masses shift the center of mass away from the midpoint, which creates two different gravity levels when rotating.

Question

Does my design have to be 3D printed?

Answer

No, you can use “found” objects. Please review the list of acceptable materials. Regardless of how it is constructed, it must be sturdy with no loose parts. All loose parts will float away. Your spacecraft must be sturdy to survive a “shake” test, be turned upside down.

1. The Tether

Question

The Quick Start Guide describes the tether as "robust," while the Handbook mentions flexible or semi-rigid (page 7) and a "flexible double tether" (pages 22-23). It also notes that middle school students could locate the center of mass by balancing the tether. I am having trouble visualizing how this works with a flexible double tether.

For elementary students, I planned to have them explore the center of mass by balancing rulers on unsharpened pencils and adding washers in different positions. This would allow them to see how mass placement affects the center of mass.

Would it be acceptable to use a single tether, such as a 3D-printed rod, and still use the same balancing process to find the center of mass?

Answer

"Robust" in the Quick Start Guide refers to robust attachment, not to a stiff tether. In the Handbook, a "flexible double tether" means two parallel cords, or one cord looped through the COM ring, so the modules stay aligned and do not accumulate twist. The balancing method still works because you first pull the tether straight and taut, then slide a finger or pencil under it to find the balance point.

Yes. Your elementary activity using rulers, pencils, and washers is acceptable as an introductory center-of-mass demonstration.

For the station design itself, a single tether is acceptable as long as it is flexible or semi-rigid and you still provide a COM ring, or equivalent, at the correct location. The book is clear on the use of a flexible tether; otherwise the concept does not work in the narrative. To the extent possible, participants should design around that concept.

2. Turntable or Spinning Mechanism

Question

I have not been able to locate a physics turntable with a spindle in our district or at local colleges. I do have access to a flat, non-motorized turntable. The COM ring on page 7 is described as needing to fit over a spindle. Could we tape it down on the flat turntable or a chair? In zero gravity, would I simply spin it with a finger? Does the COM need to be ring-shaped, or would a small handle work? If a spindle ring is required, what size should it be?

Answer

A flat, non-motorized turntable, or a board on a swivel chair or lazy-Susan base, is acceptable as the spin rig. The system must rotate about its true center of mass, so the design must include a COM ring or loop that a spindle, central pin, or fixed post passes through to define the rotation axis. Taping the COM point down to a flat surface generally adds friction and constraint and tends to produce wobble rather than clean rotation, so it is not the recommended approach.

To use a flat turntable, install a small vertical pin or post at the center of the turntable, or through the board, and let the COM ring rotate around that pin. Then spin gently by hand until the tether pulls taut and rotation becomes steady.

Functionally, the COM feature must be a closed loop or rigid ring or tube segment that the axis passes through. A handle that does not capture the axis will not constrain the rotation axis the same way and is likely to slip off.

The ring size is a design choice that depends on the scale of the station design.

3. 40 RPM

Question

The 40 RPM seems too slow to lift a very flexible center of mass tether. Even with a more rigid 3D-printed tether, I do not expect significant lift of items inside the crew module. Should we consider just observing movement toward the "lab" area with small items? Does this match your expectations?

Answer

The underlying assumption is off: the ground spin test is not intended to lift the crew or prop modules or visibly suspend them. On Earth, the modules are supported during rotation. The purpose of the ground test is to establish and verify the radial, or centripetal, acceleration field and to check that the design spins stably about the COM.

In microgravity, lift is not required. What matters is that rotation produces a measurable outward acceleration at the crew-module radius. On the ground, a very flexible tether may sag and look unimpressive, but that does not invalidate the design. It mainly affects how cleanly you can demonstrate the intended acceleration with small indicators. Your ground testing should support both modules on a plane or board, as described in the Handbook, so lift is not an issue.

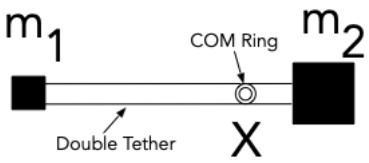
4. COM Ring

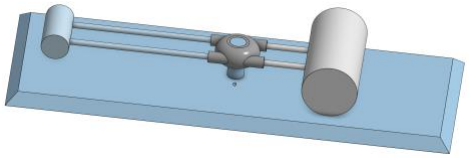
Question

Various questions on the COM Ring design.

Answer

The COM Ring must be positioned at the true center of mass of the complete two-mass system, so the spacecraft spins in a stable way. In the diagrams below, “X” marks that center of mass. The ring can be as simple as a key ring or a short section of PVC tubing, provided it forms a closed loop and is securely attached.





Question

Does the COM ring have to be attached in the model's stored/transportation mode or is it a safety feature which is only implemented during the testing phase and is not pertinent to the design itself?

Answer

The COM Ring is only used during rotation (testing or flight) to ensure that the rotation axis lies at the center of mass (COM) of the system. The COM Ring does not have to be attached during storage/transportation.

5. Video Length

Question

According to the PHM Challenge Quick Start Guide it is 3 - 5 mins but in the PHM Challenge Competition Handbook it is 2 - 3 mins? Assuming the Competition Handbooks superseded the Quick Start Guide.

Answer

The video overview should be 2-3 minutes in length. We will update the QuickStart Guide to be consistent with the Handbook.